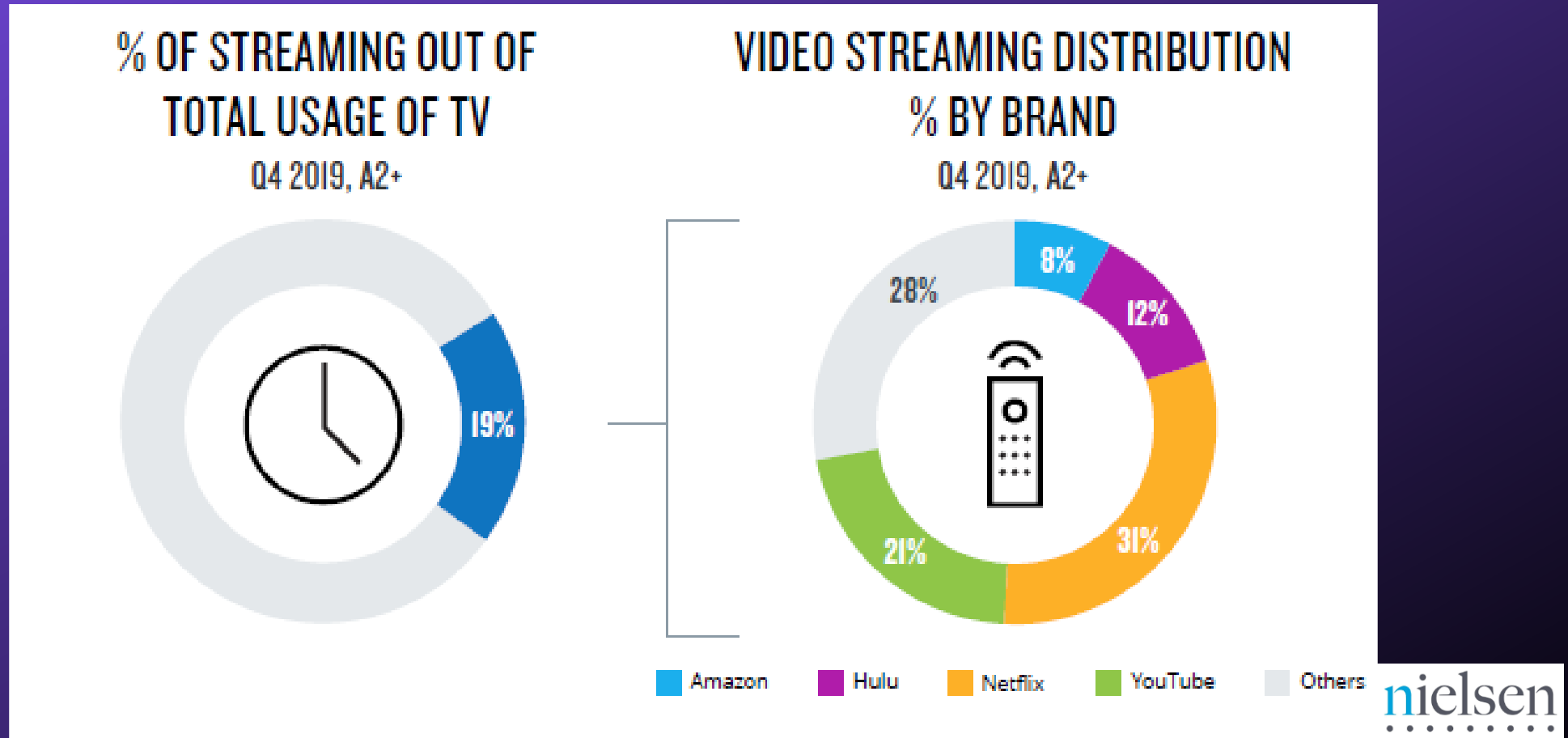# Broadcasting Trends in the USA

By Robert P. Seidel

Former CBS VP Engineering & Advanced Technology,

Former President SMPTE,

Chairman Engineering & Technology Emmy® Committee

National Academy of Arts and Sciences,

Operating Partner- Lakewood Advisors

Broadcasting Trends in the USA

- **Streaming**
- **Next Generation TV - ATSC 3.0**
- **4K UHDTV**
- **High Dynamic Range (HDR)**
- **IP Production**

Streaming in the USA

❑ **Per the audience research firm, Nielsen's, Total Audience Research Report from Feb 2020, 19 % of all TV usage is streaming services.**

% OF STREAMING OUT OF TOTAL USAGE OF TV
Q4 2019, A2+

19%

VIDEO STREAMING DISTRIBUTION % BY BRAND
Q4 2019, A2+

8%
12%
28%
31%
21%

- Amazon
- Hulu
- Netflix
- YouTube
- Others

nielsen

Streaming in the USA

❑ **All the major Broadcast and Cable Networks now offer a direct to consumer streaming service.**

❑ **Many networks are removing their content from Netflix and making it available on their own streaming service, including Disney/ABC, Fox, NBCU, CBS, Showtime, HBO, etc.**

❑ **Fox jumped into streaming by agreeing to buy Tubi. Pricetag is $440 million. (**Tubi is a streaming service based in San Francisco, California, United States, that launched in 2014. It is a free, ad-supported service, with advertisements shown during un-skippable commercial breaks during programming.**)**

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Streaming in the USA

- ❑ **Disney+ signed up over 10 million subscribers in the first week. The worldwide subscriber numbers as of April 2020 were 50 million and continuing to grow.**

- ❑ **Disney+ went live in the U.K., Ireland, Germany, Italy, Spain, Austria and Switzerland on March 26; Disney also confirmed a delayed debut in France on April 7. This is the largest multi-country launch for the service so far. Disney + was asked to limit the bandwidth by 25% during the "work at home" requirement imposed by the Coronavirus.**
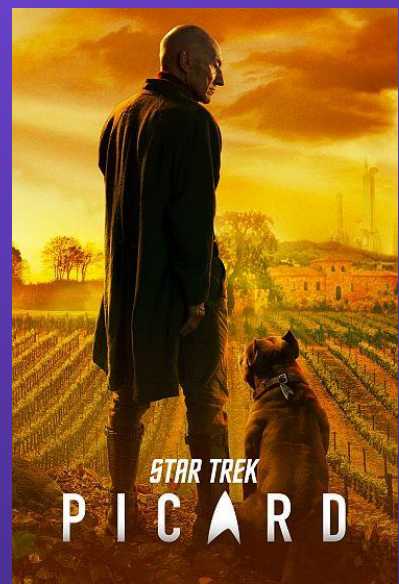
Streaming in the USA

❑ **The number of subscribers for CBS All Access and Showtime is now over 13.5 million and continues to grow.**

❑ **Subscribers have been growing at a 60% rate, year over year.**

❑ **Viacom/CBS is in the process of revamping their streaming services to include multiple tiers: free, broad-pay and premium pay.**

❑ **Pluto TV is ViacomCBS's free ad supported streaming service that has over 250+ channels and thousands of movies. https://pluto.tv/live-tv/paramount-movie-channel?utm_source=homepage**

Streaming in the USA

❑ **CBS ALL ACCESS is offering first run exclusive programming to drive subscriber growth.**

Streaming in the USA

❑ **CBS ALL ACCESS also provides the live local CBS TV stations in 200 cities.**

❑ **In addition to first run TV series, CBS ALL ACCESS offers over 12,000 episodes of TV content, as well as Sports and local news. By 2022, it's expected that both CBS All Access and Showtime OTT will have amassed 25 million domestic subscribers combined.**

❑ **CBS ALL ACCESS is available on a wide variety of mobile phones, tablets, gaming platforms, TV sets and other in-home devices.**

Streaming in the USA

❑ **The following CBS owned stations are offering a 24 hour a day, 7 day a week local news streams- CBSN. It is available for free as a stand-alone service and/or part of the ALL ACCESS Subscription:**

➢ **New York, Los Angeles, Boston San Francisco, Chicago, Dallas-Fort Worth, Philadelphia, Minneapolis-St. Paul, KCNC Denver, Miami, Sacramento, Pittsburgh and Baltimore.**

❑ **CBS is also offering 24 /7 CBS Sports HQ and a Hollywood news magazine stream, " ET Live".**

Streaming in the USA

❑ **Cost per month for streaming services.**

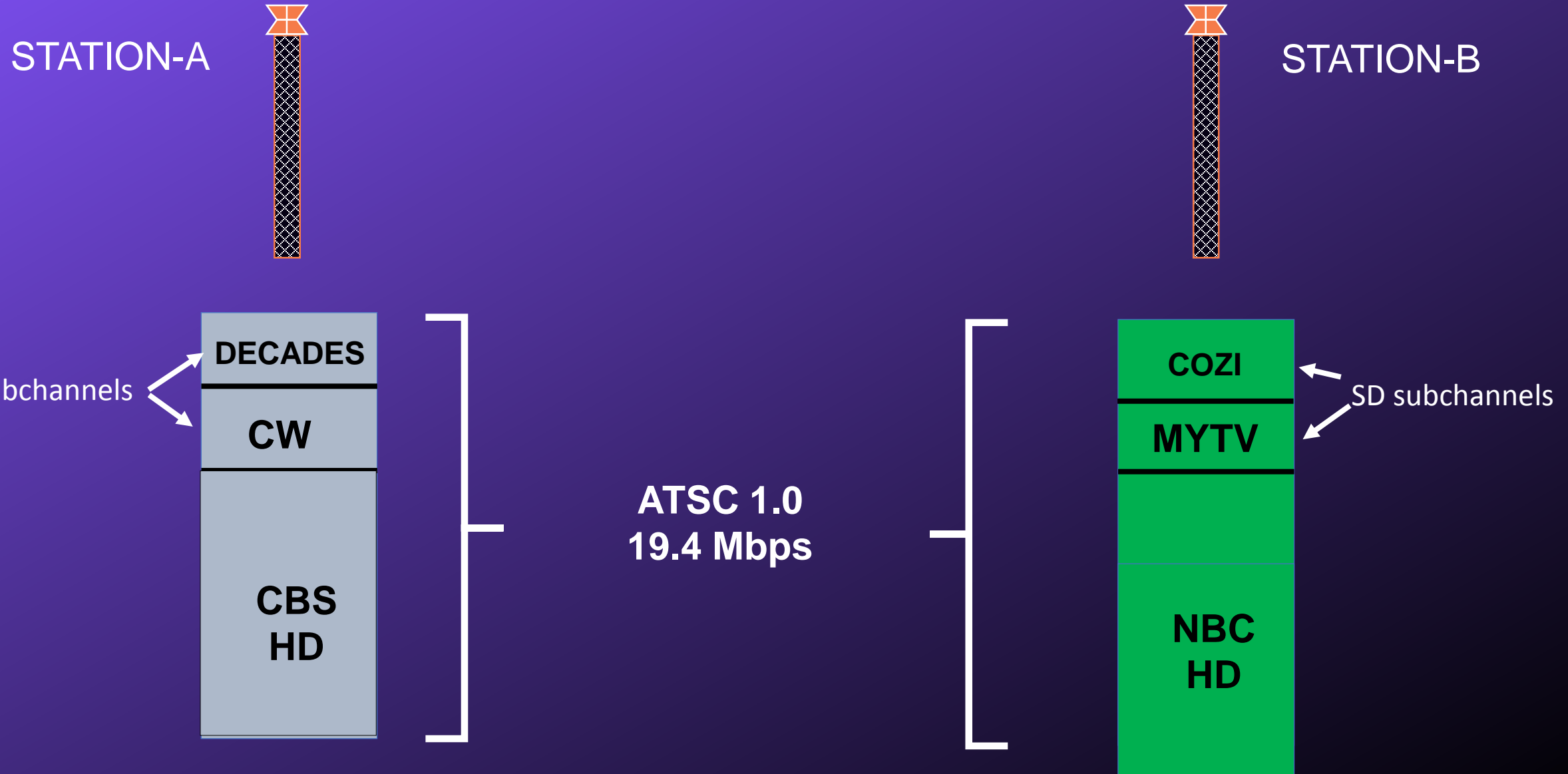| Service	Price /mth with comm	Price /mth without comm
HBO MAX	-	$14.99
Hulu +Disney+ ESPN	$12.99	-
Netflix	$8.99	-
Disney +	$6.99	-
CBS ALL Access	$5.99	$9.99
Apple TV	$4.99	-
NBCU Peacock (Ad supported)	(1) Free limited programming; (2) Ad-supported complete version, free to existing Comcast customers; (3) $5.00 non-Comcast customers	$10.00
ABC	Linked to TV provider subscription	

Next Generation TV- ATSC 3.0 in the USA

❑ While the Federal Communications Commission (FCC) has approved the use of the ATSC 3.0 modulation standard, they have not provided any new spectrum to broadcast the new TV signal.
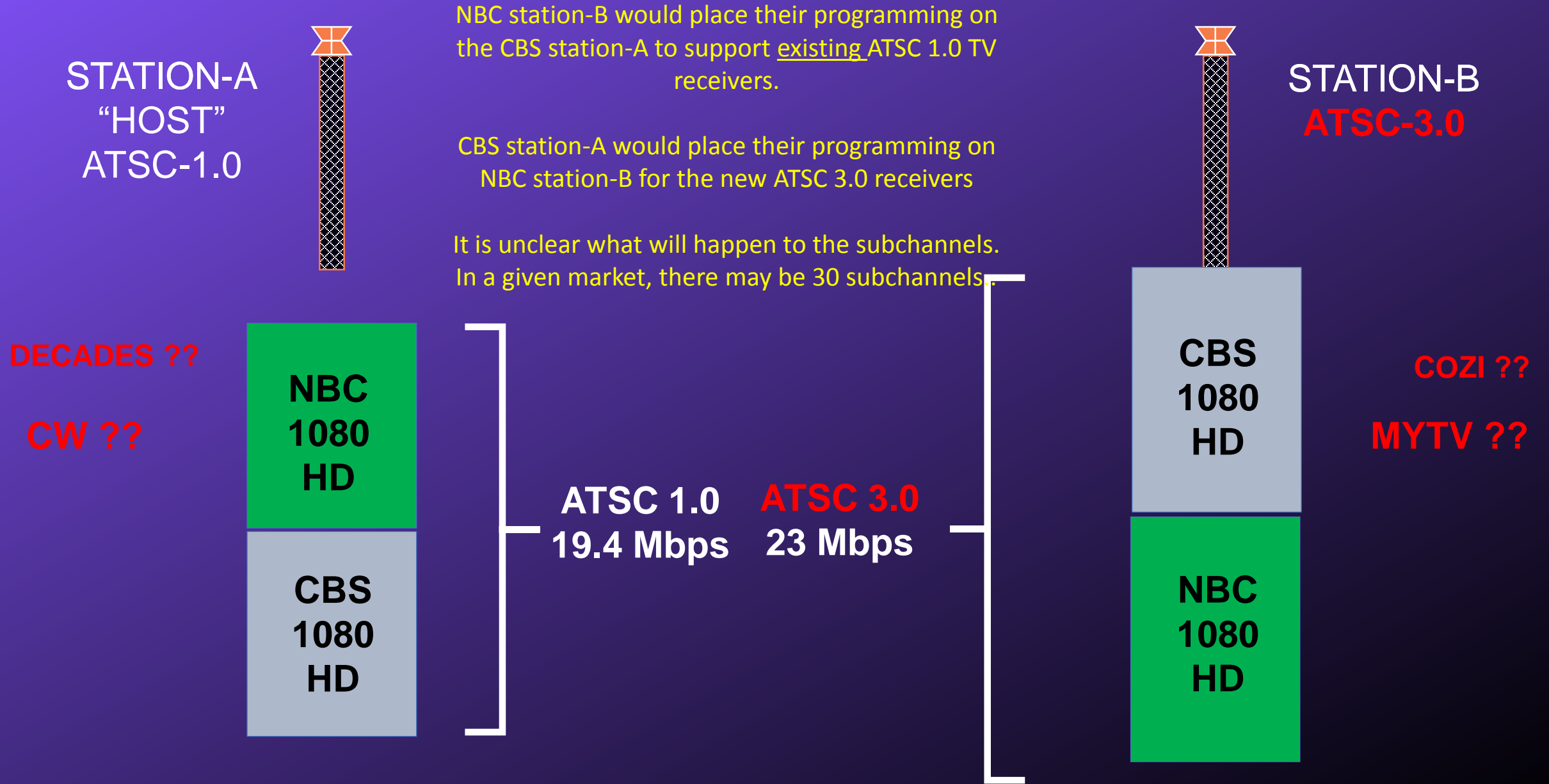
❑ The FCC has <u>not mandated</u> a transition to ATSC 3.0, so it is a <u>voluntary</u> local TV station decision.

❑ The FCC has <u>not required</u> TV manufacturers to include this new technology in the TV sets. It is a voluntary receiver manufacturer decision.

❑ The FCC has <u>not required</u> the Cable and Direct Broadcast Satellite providers to carry the ATSC 3.0 signal or its enhanced features, such as HDR, 4K , targeted Ads, etc.

❑ The business plan to support this new technology needs to be clarified.

❑ There are experiential stations on-the-air in Phoenix, Cleveland, Dallas, Chicago.

❑ By the end of 2020, the National Association of Broadcasters (NAB) predicts there will be 40 cities on the air with ATSC 3.0 as "light house" stations to provide signals during the transition.

Transition from ATSC 1.0 to ATSC 3.0 with no new spectrum
(current situation)

STATION-A

STATION-B

DECADES

CW

SD subchannels

CBS
HD

**ATSC 1.0
19.4 Mbps**

COZI

MYTV

SD subchannels

NBC
HD

Transition from ATSC 1.0 to ATSC 3.0 with no new spectrum

STATION-A
"HOST"
ATSC-1.0

NBC station-B would place their programming on the CBS station-A to support <u>existing</u> ATSC 1.0 TV receivers.

CBS station-A would place their programming on NBC station-B for the new ATSC 3.0 receivers

It is unclear what will happen to the subchannels. In a given market, there may be 30 subchannels.

STATION-B
ATSC-3.0

DECADES ??

CW ??

NBC 1080 HD

CBS 1080 HD

ATSC 1.0 19.4 Mbps   **ATSC 3.0 23 Mbps**

CBS 1080 HD

COZI ??

MYTV ??

NBC 1080 HD

It is unclear what will happen to all the current 30 SD Sub-Channel Networks

Next Generation TV- ATSC 3.0 in the USA

- ❑ The transition plan does not provide for any 4K UHDTV.

- ❑ All stations would broadcast in the 1920 x 1080 / 59.94 Progressive video format.

- ❑ There may be some HDR services available.

- ❑ Cable and Satellite providers have indicated they do not plan to carry the ATSC 3.0 signals. Since the cable and satellite audience accounts for 80% of US TV Households, only a small percentage of the viewers will be able to see the ATSC 3.0 broadcasts.

- ❑ The question is: "Has the ATSC 3.0 Technology been overtaken by streaming services that can roll out 4K, HDR, and targeted Ads much faster and are available on the mobile 3G, 4G , 5G cellular networks and millions of existing streaming TVs, gaming consoles, tablets and PCs ?"

4K UHDTV in the USA

The Super Bowl is streaming in 4K HDR for the first time — here's how Fox Sports is pulling it off

Inside Fox's first-ever 4K stream of Super Bowl LIV

❑ The game was captured in 1920 x 1080 / 59.94 Progressive, then upscaled to 4K. (3840 x 2160 / 59.94 P)

❑ The upconversion received some negative press from Hollywood, who called it "FAUX K", similar to the popular FAKE NEWS saying. FAUX translated from the French language means FALSE.

❑ Since there is no business plan to currently broadcast 4K in the USA, the main distribution method is streaming. Because of the increased bandwidth requirements for 4K, some viewers reported frequent freeze frames and macro-blocking. When an OTT distribution path can <u>not</u> deliver the necessary bandwidth, it reduces the resolution to 1080 HD or 720 HD.

4K UHDTV Trends in the USA

HDR Trends in the USA

❑ One of the challenges with High Dynamic Range (HDR) production and distribution is there are a multiplicity of HDR formats.
  ➢ Hybrid Log-Gamma (HLG) ITU BT.2100.
  ➢ HDR 10 (PQ) SMPTE ST 2084-ITU BT.2100.
  ➢ HDR 10 +
  ➢ HDR +
  ➢ S-LOG (Sony)
  ➢ SLR-HDR-1
  ➢ Dolby Vision IQ (Ambient light sensor + dynamic metadata).
➢ Multiple HDR formats are creating confusion in the marketplace and conversions between HDR formats can create issues.
❑ A method to automatically adjust the TV to the HDR format needs to be developed or standardize on a single format.
❑ Not all TVs support all the HDR formats.

HDR Trends in the USA

The Super Bowl is streaming in 4K HDR for the first time — here's how Fox Sports is pulling it off

Inside Fox's first-ever 4K stream of Super Bowl LIV   TheVerge

The game was captured in the HLG HDR format that's used almost exclusively for live events — Steven Thorpe, VP of video platforms for Fox Sports, said "From a production perspective, HLG is really the only way technically today to do live HDR through a live sports production workflow." And that HLG stream will still be used for traditional broadcasts on DirecTV, Dish, Altice Optimum, Verizon Fios, Xfinity, and FuboTV.

"Our goal is to have them [the HLG and converted HDR 10 streams] be very similar," explains Thorpe. "Of course, if you get somebody who looks at color for a living, I'm sure that they could pick out a few little minor differences."

HDR Trends in the USA

- HBO's – *"Game of Thrones"* was streamed in 4K -HDR and received a huge amount of negative press coverage.

Display Daily

HOME   FREE NEWS   DISPLAY MONITOR ▾   EVENTS ▾   VIDEOS   👤 LOGIN

DISPLAY DAILY   9 months ago

Games of Thrones: The Very Dark Night - What went wrong (and how can WE fix it)?

"Game of Thrones (GoT) Episode 803, "The Long Night", recently took over social media - with fans complaining about the cinematography and color grading, delivering scenes so dark the images were nearly indecipherable. The epic 'Battle at Winterfell' was the culmination of 80 episodes of anticipation and had an overnight viewership of 17 million(!). Yet the next morning HBO woke up to news headlines they were not expecting.

HDR Trends in the USA

- HBO's – Game of Thrones was streamed in 4K – HDR.
  - ➤ The 4K HDR version was delivered to the home via the HBO GO streaming service using PQ, which is a "scene referred" HDR format that reproduces the original camera light levels. However, home living rooms have ambient light which can " obscure the low-level black images. HLG -HDR format is "display referred" and does not have this drawback.

  - ➤ The Game of Thrones was captured in 1080 and up convereted to 4K UHDTV, which increased the required bandwidth to the home, resulting in macro-blocking and posterization.
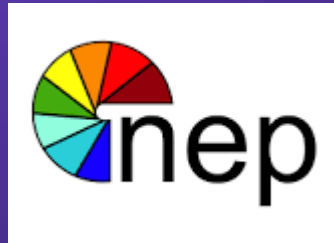

Image:HBO via winteriscoming.net

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HDR Trends in the USA

❑ CBS has produced a number of Sporting events in HLG - HDR for DirecTV, including:
- ➢ The Masters golf tournament.
- ➢ NFL Football Games.
- ➢ PGA Golf Tournaments.

❑ None of these events appeared on the CBS TV Network, because currently there is no way to deliver them to the home via over-the-air transmission and cable set top boxes do not yet support HDR.

❑ Over The Top (OTT) streaming services will be the primary method of HDR distribution in the near future.

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IP Production in the USA

❑ **There are two primary IP production formats SMPTE 2022 and SMPTE 2110.**

❑ **Large mobile unit (OB) vendors such as, NEP, Game Creek are building only IP based production OB vans.**
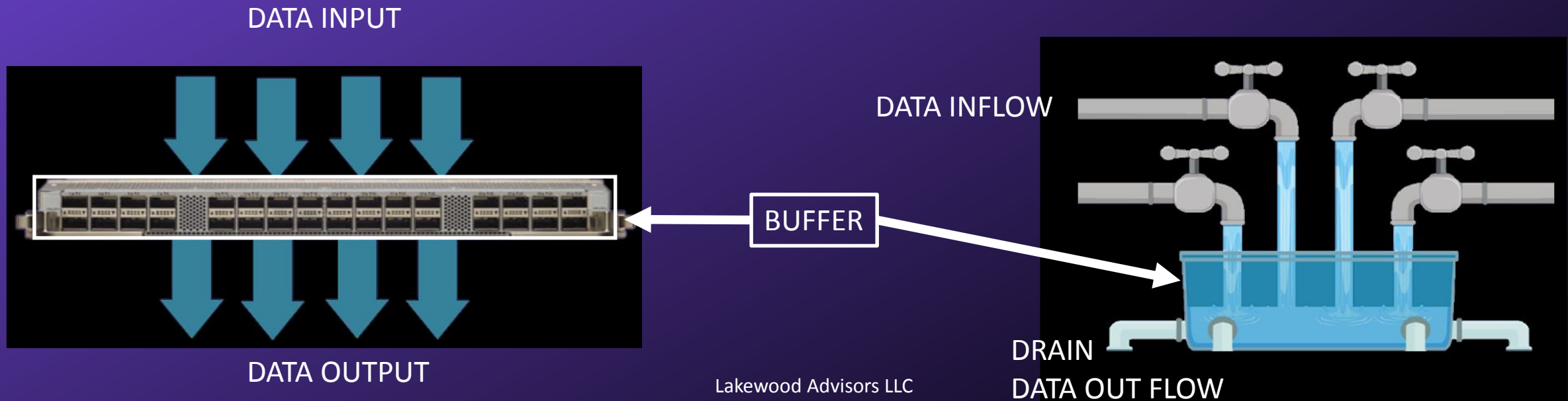

❑ **NBC's coverage of the 2020 Olympics in Japan will be based on a Grass Valley IP router.**

❑ **The Canadian Broadcasting Corporation's (CBC) new Broadcast Center is based on IP audio/ video distribution.**
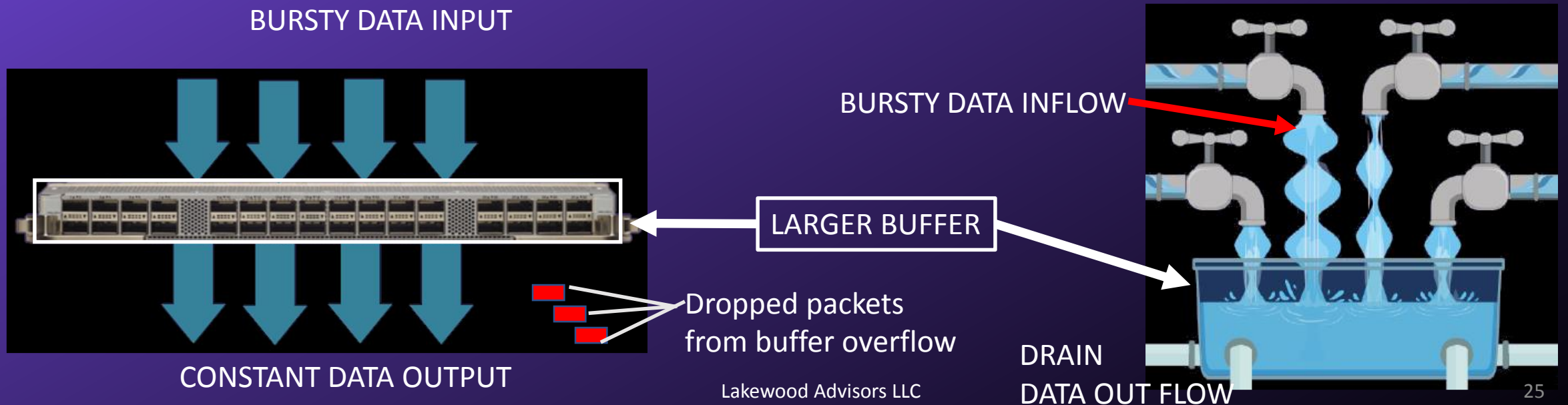

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SDI vs IP Production

❑ One of the differences between Serial Digital Interface (SDI) and Internet Protocol (IP) switching is that SDI switching is "non-blocking" with guaranteed through-put from the source to the destination.

❑ With IP switching it is necessary to management the amount of data transmitted by the sender to the receiver, as well as understanding the buffer size in the ethernet switch. In this diagram, the data inflow rates are constant.

DATA INPUT

DATA INFLOW

BUFFER

DATA OUTPUT

DRAIN
DATA OUT FLOW

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SDI vs IP Production

❑ However, data input flows can increase and decrease creating "bursts " of transmitted data.

❑ Random and unregulated traffic patterns may temporarily overflow buffers, even if average bandwidth is not exceeded.

BURSTY DATA INPUT

BURSTY DATA INFLOW

LARGER BUFFER

Dropped packets
from buffer overflow

CONSTANT DATA OUTPUT
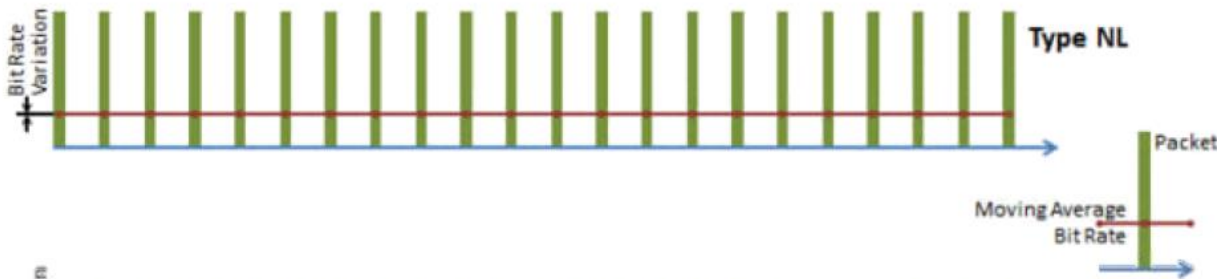
DRAIN
DATA OUT FLOW

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25

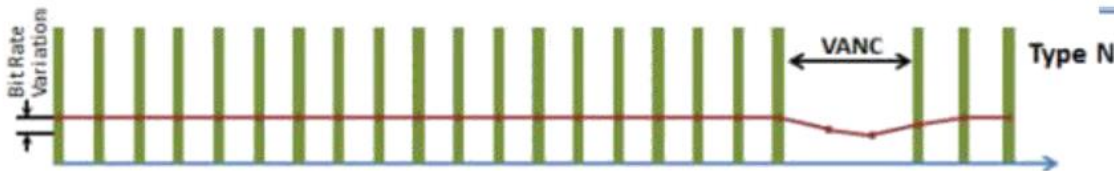# SMPTE ST 2110-21 Video – Traffic Shaping and Delivery Timing

❑ In order to address different types of data flows from the sender, SMPTE defined sender - drain behavior (packet egress pacing and spacing) and (receiver) buffer requirements.

❑ •There are 3 models or Types of sender traffic shaping:
  ➢ Narrow-linear (**NL**) Sender– packet are drained evenly distributed across the frame period .
  ➢ Narrow (**N**) Sender– packet drain closely follows SDI signal timing (no packets during VBI and VANC) .
  ➢ Wide (**W**) Sender– allows increased "burstiness" (accommodates Software -based senders).
  ➢ The moving average is shown by the redline. Please refer to the SMPTE standard for the mathematical formulas.
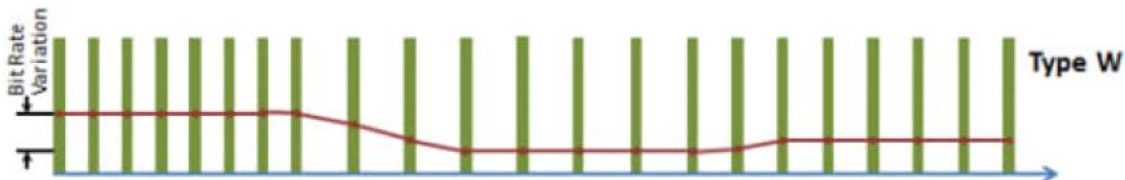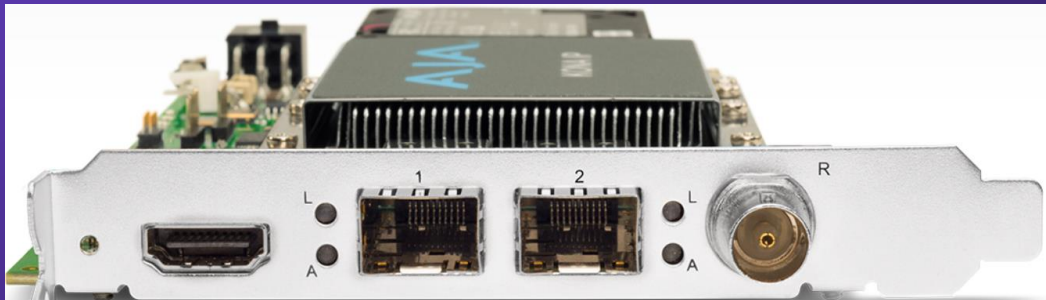
IP Production in the USA

❑ **Canadian Broadcasting Corporation (CBC) Lessons learned:**

➢ **Each individual (or enterprise) has a different definition of COTS (Commodity Off-The Shelf).**

➢ **Specialized ST2110 hardware based Network Interface Cards (NIC) work very well.**

➢ **With reference to the SMPTE 2110-21 Types: N (or even W) profiles are difficult to achieve in software.**

➢ **The best software based senders meet the N –Profile(Narrow) 99.9% of the time, however, they exceed the profile 0.1 % of the time , which can cause intermittent issues. The W- Profile is easier to meet. However, in practice, the software exceeds the W-profile a small percentage of the time. (i.e. packets arrive late). As a result, the W-profile sender never achieved market acceptance and most manufacturers do not use software based sender and instead use purpose-built NICs.**

➢ **First generation gateways (those that were shipped as ST2022-6) are very limited in terms of functionality (# of audio streams, ability to support W senders, …).**

➢ **"Precision Time Protocol (PTP) is hyper critical … and the initial CBC design created an internal Distributed Denial of Service (DDoS)! It's a bad idea to slave a grandmaster to Black Burst sync. Some gateways requires both PTP and Black Burst sync."**

➢ **CBC's project ran over budget.**

IP Production in the USA

❑ **While pure–software based senders never achieved market acceptance, there are some NIC-assisted transmitters, such as Mellanox ConnectX that uses a special driver.**

❑ **The third alternative for software based products is to use a purpose –built Network Interface Card (NIC), such as the AJA KONA-IP that can support one or two HD signals or at the high end, the Matrox X.MIO5 Q25 that can support one or two UHD signals.**

IP Production in the USA

❑ **CBS updated their Washington News Bureau to an IP infrastructure (SMPTE-2110). However, there are very few IP sources and destinations, so there are many SDI to IP and IP to SDI gateway converters. Even with redundant IP routers, major air losses have occurred resulting in a complete loss of the Evening News broadcast to major markets.**

https://variety.com/2020/tv/news/cbs-evening-news-technical-issue-norah-odonnell-mark-zuckerberg-1234611340/

❑ **Comcast / Telemundo Center in Miami is a 13,000 x 13,000 IP router and distribution system. (SMPTE 2110).**

❑ **Lessons learned:**
  ➢ **Each SDI to IP (Encapsulation) and IP to SDI (Decapsulation) is a separate process that must be managed. (i.e. audio / video lip sync)**
  ➢ **Redundant paths are essential.**
  ➢ **Deployed separate networks: ST2110, Revenna for Communications, Dante for audio sources.**
  ➢ **Segmented IP production Network from IP Acquisition Network.**
  ➢ **The project ran over the budget and was delayed.**

IP Production Forum: An Inside Look of Telemundo Deportes' IP-Based Facility

IP Production Benefits / Challenges

❑ IP Production is very flexible and easily expanded.

❑ When interconnecting two or more OB VANs, IP address space can be difficult to coordinate or require Network Address Table (NAT) mapping that can add path timing delays. Other issues that need to be managed closely to protect the IP Network from system wide failures are "Broadcast storms" and duplicate IP addresses, managed data flows, Precision Time Protocol (PTP) attacks.

❑ IP equipment is currently more expensive than SDI and has not yet provided the predicted cost savings by using Common Off The Shelf (COTS) hardware that should have provided cost savings from economies of scale.

❑ When installing and testing IP Systems, it takes 2 to 3 times longer.

❑ The "cost of ownership" should include testing time for continuing software upgrades.

❑ Engineering and Maintenance Staff will require additional training.

❑ IP production systems are susceptible to "hackers". Additional time and equipment must be budgeted for Cybersecurity. Ex. Protection from the Russian Fancy Bear.

❑ Must implement on-going software upgrades and testing to correct cybersecurity threats . "Patches". Triple level firewalls, Active directory, Penetration tests, failover testing, dual IP routing.

❑ An off-line test facility is highly recommended.

Thank you
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